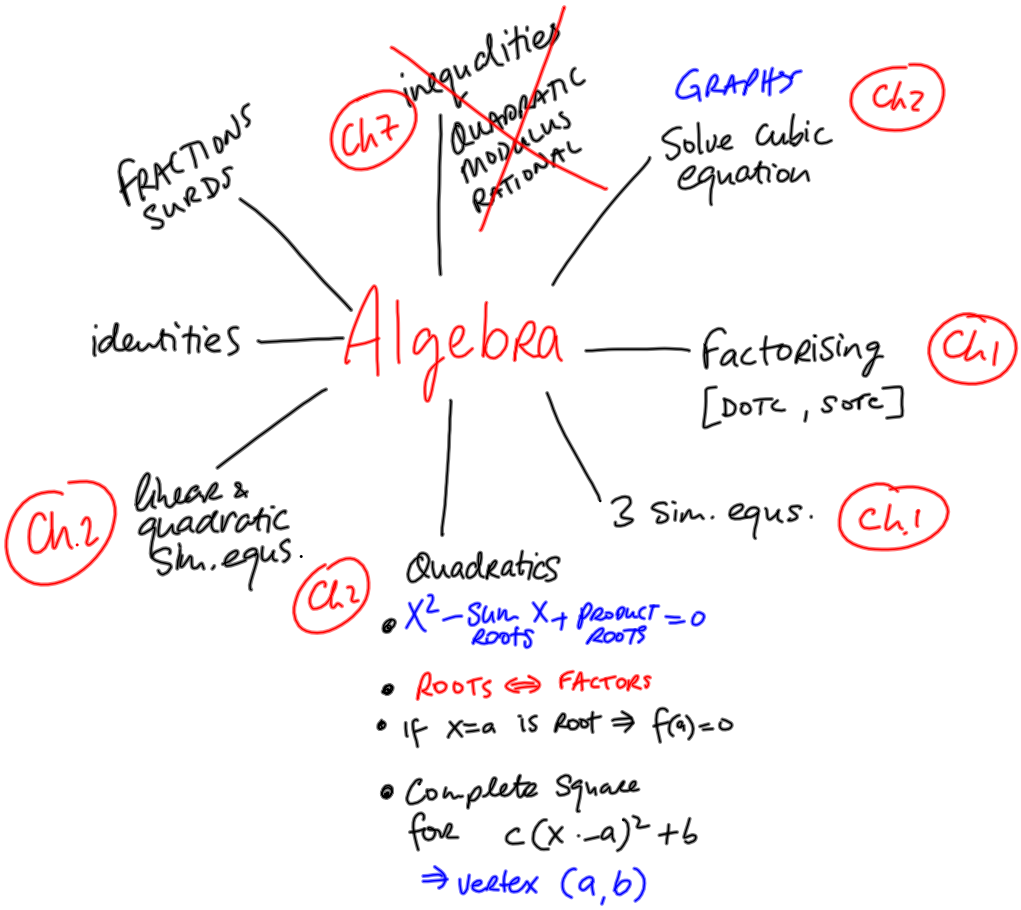
$$b^n = a \iff n = \log_b a$$

$$81 = 3^? \iff n = \log_{\boxed{3}} \boxed{81} = 4$$



FACTORISING

DOTS

$$a^2 - b^2 = (a+b)(a-b)$$

DOTC

$$a^3 - b^3 = (a-b)(a^2+ab+b^2)$$

SOTC

$$a^3 + b^3 = (a+b)(a^2-ab+b^2)$$

Factorise

$27 - 8x^3$

Difference of 2 cubes

$a^3 - b^3 = (a-b)(a^2+ab+b^2)$

$a^3 = 27 \Rightarrow a = 3$

$b^3 = 8x^3 \Rightarrow b = 2x$

$= (3-2x)(9+6x+4x^2)$

If $x^2 - kx + 1$ is a factor of $ax^3 + bx + c$. Show $c^2 = a(a-b)$

DIVIDE

$$\begin{array}{r} ax + ak \\ x^2 - kx + 1 \;\overline{)}\; ax^3 + 0x^2 + bx + c \\ \mp ax^3 \pm akx^2 \mp ax \\ \hline akx^2 + (b-a)x + c \\ \mp akx^2 \pm ak^2x \mp ak \\ \hline 0x + 0 \end{array}$$

REMAINDER = 0

$\Rightarrow$ $b - a + ak^2 = 0$

$ak^2 = -b + a$

$ak^2 = a - b$ (1)

$\Rightarrow$ $c - ak = 0$

$c = ak$

$\Rightarrow$ $k = \frac{c}{a}$ (2)

SOLVE

(2) $\rightsquigarrow$ (1) $\Rightarrow$ $a\left(\frac{c}{a}\right)^2 = a - b$

$\Rightarrow$ $\frac{ac^2}{a^2} = a - b$ $\Rightarrow$ $\boxed{c^2 = a(a-b)}$ QED